Light and Lighting

Official Journal of the Illuminating Engineering Society.

Incorporating "The Illuminating Engineer."

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Our Fathers Have Told Us!..

DR. BUCKLEY'S fascinating account of XVIII-century photometry (see p. 33) reminds us of the saying that there is nothing new under the sun.

Over 200 years ago Bouguer and Lambert were designing photometers, only a little later Rumford was evolving his "illuminators" which have much in common with modern lighting fittings.

The resemblance, however, is one of principle only. Rumford could not foresee architectural lighting. Workers in the precision laboratory of to-day could not achieve their task with primitive XVIII-century photometers.

The most significant feature of modern experience is the speeding up of progress. Lambert, with rare pre-vision, desired a photometer "similar to a thermometer, which would indicate the intensity of a light source exposed to it."

During a long period of modern illuminating engineering, even, such an instrument was regarded as a visionary project. The writer can recall the wonder with which Mr. Trotter (surely the "father of photometry" of modern days) heard him express the conviction that the direct reading photo-electric photometer was bound to come.

Yet within a few years such apparatus has become familiar and accepted, even outside the ranks of illuminating engineers.

From Pillar to Post?

We seem to recall some I.E.S. Past President asking indignantly why the Society could not have a permanent home; why must it go "from pillar to post" in search of meeting places? That it should possess a building owned, rented, or used by itself exclusively is evidently not feasible at present; that it should share with a few other societies of similar standing is perhaps a more likely proposition. This idea of a joint home for the lesser technical bodies is of old standing and has recently been revived. Should it reach a practical stage, it deserves sympathetic consideration. But, in the meantime, is the variation of procedure necessarily a bad thing? The freedom of selecting a place of meeting with an eye to the subject under consideration has advantages. This is illustrated by the meetings held during the current session, by the end of which the I.E.S. will have been the guest of no fewer than six different bodies, in chronological order: the E.L.M.A. Lighting Service Bureau, the Institution of Mechanical Engineers, the Royal Institute of British Architects, the Royal Institution, the Royal Society of Arts, and the Imperial College of Science. We have referred above to the sessional meetings in London, but the fifty odd meetings of Centres and Groups, for which arrangements have necessarily to be made locally, are likewise held under varied conditions, though in quite a number of cases a definite meeting place, adopted for the majority of meetings, has been found possible.

Luckiesh Literature

We hope we shall be pardoned for this alliterative but conveniently brief title as a means of drawing attention to the generous gift of books (for which he, either alone or in partnership with Frank A. Moss, was responsible) made by Dr. Luckiesh to the I.E.S. library. (See Trans. Illum. Eng. Soc., London, Vol. IX., No. 2, February, 1944, p. 40.) In present circumstances such gifts are welcome indeed, and we hope that other authors will make a practice of presenting their productions. The impressive lists of volumes sponsored by Dr. Luckiesh is, however, but a part of his output, and he has also furnished a representative collection of pamphlets and smaller contributions, remarkable alike for the range of subject matter and the variety of bodies to whom these contributions were originally made.

Forthcoming I.E.S. Meetings

(Provisional List)

SESSIONAL MEETINGS IN LONDON

1944.

April 18th. Demonstrations illustrating **Principles of Illumination and Photometry.** *(Joint Meeting with the Science Masters Association, to be held at the Imperial College of Science and Technology, South Kensington, London, S.W.7.)* **5 p.m.**

May 9th. Annual General Meeting. Address by SIR CHARLES DARWIN (Director of the National Physical Laboratory). *(The Meeting will be held in the Lecture Theatre, Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1.)* **5 p.m.**

MEETINGS OF CENTRES AND GROUPS

1944.

April 3rd. Lecture on **The Application of Plastics to Modern Lighting Fittings.** *(Meeting of the Bath and Bristol Centre, to be held in the Pump Rooms, Bath.)* **7 p.m.**

April 3rd. Paper on **Lighting in the Tailoring and Garment Making Industry.** *(Meeting of the Leeds Centre, to be held in the Leeds Corporation Electricity Showrooms, The Headrow, Leeds.)* **5.15 p.m.**

April 3rd. MR. J. T. GRIMSHAW on **Post-War Planning of Lighting in Dwellings and Public Buildings.** *(Meeting of the Sheffield Centre, to be held in the Central Library, Tudor Place, Sheffield.)* **6 p.m.**

April 6th. Annual General Meeting. *(Meeting of the Newcastle Centre, to be held in the Minor Hall, Oxford Street, Newcastle-on-Tyne.)* **5.30 p.m.**

April 13th. MR. W. HODGKINSON on **Industrial Lighting by Gas.** *(Meeting of the Bradford Group, to be held in the Bradford Electricity Department Showrooms, Sunbridge Road, Bradford.)* **6.45 p.m.**

April 14th. MR. W. J. G. DAVEY on **Short Cuts in Illuminating Engineering.** *(Meeting of the Huddersfield Group, to be held in the Electricity Showrooms, Market Street, Huddersfield.* **7 p.m.**

April 21st. Address by THE PRESIDENT. *(Meeting of the Birmingham Centre, to be held at the Imperial Hotel, Temple Street, Birmingham.)* **6 p.m.**

1944.

April 28th. MR. W. R. STEVENS on **Applications of Low Pressure Fluorescent Lamps.** *(Meeting of the Nottingham Centre, to be held in the Lecture Theatre of the City of Nottingham Gas Department, Parliament Street, Nottingham.)* **5.30 p.m.**

May 1st. Second General Meeting. Followed by an Address. *(Meeting of the Bath and Bristol Centre, to be held at the Grand Hotel, Broad Street, Bristol.)* **7 p.m.**

May 1st. Annual General Meeting. Address by THE PRESIDENT, *(Meeting of the Leeds Centre, to be held in the Leeds Corporation Electricity Showrooms, The Headrow, Leeds.)* **5.15 p.m.**

May 2nd. MR. T. S. JONES on **The Future Development in Electric Lighting Technique.** *Meeting of the Derby Group, to be held in the Borough of Derby Electricity Showrooms, Irongate, Derby.)* **6 p.m.**

May 2nd. MR. W. R. STEVENS on **The Application of Low-Pressure Fluorescent Lamps.** *(Meeting of the Leicester Group, to be held in the Leicester Corporation Electricity Department, Demonstration Theatre, Charles Street, Leicester.)* **6 p.m.**

May 5th. Address by THE PRESIDENT. *(Meeting of the Cardiff Centre, to be held in the Cardiff Corporation Demonstration Theatre, The Hayes, Cardiff.)* **3 p.m.**

May 8th. MR. J. W. HOWELL on **Special Lighting Problems with Particular Reference to Industry.** *(Meeting of the Sheffield Centre, to be held in the Central Library, Tudor Place, Sheffield.)* **6 p.m.**

May 19th. DR. JAMES F. BRAILSFORD on **Light as an Aid to Medicine.** *(Meeting of the the Birmingham Centre, to be held at the Imperial Hotel, Temple Street, Birmingham.)* **6 p.m.**

Secretaries of Centres and Groups are requested to send in, as soon as available, particulars of any modifications in or additions to the revised List of Meetings for the Session as reprinted, in revised form, from the Transactions (December, 1943).

ERRATUM

We regret to observe an oversight in the account of the meeting of the Huddersfield Group on Jan. 28, reported in the last issue of LIGHT AND LIGHTING (Feb., 1944, p. 16). The inaugural address given on that occasion was not by Mr. W. J. Jones, but by *Mr. E. D. Jones*, who is associated with the Research Laboratories of the British Thomson-Houston Company, Ltd., at Rugby.

Standardisation

At the recent annual meeting of the National Illumination Commission Mr. Percy Good was able to give some first hand information of recent progress towards co-operation between the Allied nations in connection with standardisation. We observe in *Illuminating Engineering* a reference to a meeting of the American Standards Association held in New York last December, at which the participation of that body in an Allied Nations Standard Body was agreed. For some time the organisation of such a body has been the subject of informal conferences between the British Standards Association, the Canadian Engineering Standards Association, the American Standards Association and with key agencies of Governments in the three countries. The object is to secure maximum co-ordination of standards necessary for the war effort and the immediate post-war period. A skeleton staff will be provided with offices in London and in either New York or Washington.

Lighting a Small Commutator

We are happy to notice in *Illuminating Engineering* a contribution on the above subject by a British expert, Dr. J. H. Nelson, who is associated with the Joseph Lucas Research Laboratories in Birmingham. The special problem described by Dr. Nelson was the illumination of small commutators so that all details may be fully visible during the operation of under-cutting the mica separators used as insulators between the copper segments. For this purpose one cannot rely on the general illumination in the room partly because of the nature of the lighting and partly because of the vital necessity to surround the commutator with an extractor to remove the dangerous mica dust, the face of the operator being shielded by a vizor. Reflection in the polished commutator surface of a source of moderate brightness and subtending a relatively large angle is desirable. This takes the form of a low wattage lamp placed beside an opal screen. The surfaces adjacent to the commutator are painted a light cream, thus providing a comfortable surround. The mica separators contrast boldly with the uniformly bright commutator surface and the operator can see clearly, comfortably and safely.

I.E.S. Sustaining Members

The strengthening of its "sinews of war" may have a definite influence on the future activities of the I.E.S. and additions to its list of Sustaining Members are very desirable. We commend this mode of buttressing local strength to the various Centres and Groups. It is no bad thing to be linked in this way with local gas and electrical supply authorities or undertakings or lighting firms of standing. The field for co-operation, however, is wider than might be imagined. We are reminded of the success of the Birmingham Centre in this particular field, to which we recently drew attention, and we observe that its latest recruits include some firms of repute who are apparently not directly associated with lighting but have nevertheless become interested in what the Centre, and the I.E.S. as a whole, is doing.

Obituary

H. LINGARD, M.B.E., M.I.E.S., F.I.E.S.

We record with deep regret the death of Mr. H. Lingard, which occurred, at the early age of forty, on March 12

Mr. Lingard had been associated with the E.L.M.A. Lighting Service Bureau, of which he ultimately became deputy manager, since its inception. After the outbreak of war his activities were temporarily transferred to the Ministry of Supply and it will be recalled that his valuable service gained for him last year the distinction of M.B.E.

Mr. Lingard was a Member of Council of the Illuminating Engineering Society, and a very useful member of the panel responsible for the revision of the I.E.S. code. He took an active part in the society's meetings, kept in touch with its work, and maintained a keen interest in its progress, in spite of the pressure of his responsible war duties.

He united sound technical knowledge and practical sagacity with a simple and kindly disposition which won him many firm friends in the lighting industry, by whom he will be greatly missed.

Illuminating Engineering in the XVIIIth Century

Notes on the Presidential Address delivered by Dr. H. Buckley to the Illuminating Engineering Society on 18th February, 1944.

The Illuminating Engineering Society enjoyed a dip into the past on February 14, when its president (Dr. H. Buckley) delivered his inaugural address—unavoidably postponed from the commencement of the session owing to his absence on special duties.

The meeting was held in the historic lecture theatre of the Royal Institution. Dr. C. C. Paterson and Professor J. T. MacGregor Morris, when subsequently proposing a vote of thanks to the lecturer, emphasised the privilege of enjoying the hospitality of the Institution in this historic room. It is an interesting fact that a number of those connected with the founding of the Royal Institution, notably Count Rumford, went quite deeply into the study of photometry.

In introducing his subject Dr. Buckley quoted an imposing list of famous scientists who had devoted themselves to this study, but he confined himself mainly to the work of three of them, Bouguer, Lambert, and Rumford.

Bouguer's work was of a very varied nature. He endeavoured to show that the difference in temperature in summer and winter could be related to the ratio of noon sunlight at the two solstices, and he made elaborate comparisons of the light from the moon at various elevations with that of a candle. These experiments started him upon the study of photometry; the estimation of the "force" or "vivacity" of light and the calculation of the transmission of light through various media and of the atmosphere. Bouguer's work on photometry and the various instruments he contrived have been described by a former president of the society, Mr. A. P. Trotter. Of these there were quite a number, such as the "lucimeter" and "heliometer" for measuring sky brightness.

The most interesting part of Lambert's work, also studied in detail by Mr. Trotter, was the derivation of what are now known as the Inverse Square Law and the Cosine Law. Another investigation had for its object the determination of the variation in size of the pupil of the eye as the illumination upon it was altered. In conclusion Dr. Buckley remarks, "Although written about 180 years ago Lambert's work on photometric calculations still remains the outstanding one as regards completeness even to-day."

Rumford had an interesting and romantic career. He was born in America, entered the service of the Elector of Bavaria, where he reorganised the Bavarian Army, and spent much time in Paris and London. It was largely due to his efforts that the Royal Institution took form and received a charter from George III. in 1800. His "shadow photometer" is a familiar one, described in textbooks, but he contrived others and made many experiments on lamps and fittings. His various "illuminators" for drawing-rooms, dining-rooms, and tables have a marked resemblance to some devices of to-day. His treatise on "The Management of Light in Illumination" may well be described as the first treatise on illuminating engineering.

An interesting feature of Dr. Buckley's lecture was the series of lantern slides made from old illustrations of these early instruments and devices.

Colour in Everyday Life

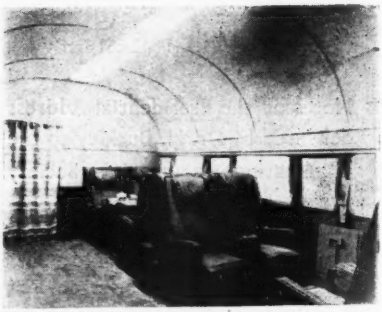
Impressions of the Exhibition arranged by the British Colour Council at the Royal Academy (Piccadilly, London).

This charming little exhibition was arranged by the British Colour Council with a view to illustrating the nature of the long chain of production from dye-stuff makers to the ultimate consumer—the public—involving at every stage the work of the artist and craftsman. It also served to show the possibilities of colour in adding grace to everyday life in post-war days—often by quite simple methods.

The display was concentrated in six galleries dealing with Colour in the Home, Colour in Everyday Things, Colour and Design for Children, Seasonal Colours in Women's Dress, "Behind the Scenes" (scientific and design), Colour and Design in Civil Aviation, and—in the Central Hall—"The Artist as an Inspiration to Industry."

One element which added greatly to the effectiveness of the display was the artificial lighting throughout, by means of fluorescent lamps installed by the British Thomson-Houston Company, Ltd. A main feature was their treatment of the aeroplane cabin, here illustrated, but all the exhibits gained greatly from the use of artificial lighting, which helped to supplement the daylight from above in a remarkable degree. It was, for instance, noticeable that the cove-lighting by means of concealed fluorescent lamps was even more pleasing than if no daylight had been present, probably because of the softening effect on contrasts, which made the artificial lighting fall naturally into place.

Some of the colour schemes worked out in the series of domestic scenes (dining-room, lounge, nursery, bedroom, etc.) were delightful, and the display of colours for women's dresses was an object-lesson in how to stage a wide variety of colours and yet to give a general harmonious effect. In both cases the addition of the fluorescent lighting manifestly enhanced the effect.



The full-size replica aeroplane cabin with lighting arranged to simulate the effect of warmth or coolness as required by external weather conditions. The main lighting is given by 5-ft. 80-watt Fluorescent Lamps in Trough Fittings.

In view of the prospect of great strides in civil aviation after the war the aeroplane exhibit was most timely. It must be recognised that aircraft may take off from a London airport on a dull November day, fly most of the journey in the glaring light of the sub-stratosphere, and land eventually in the rich, strong sunlight of the tropics. The interior lighting should be adjusted accordingly, and this exhibit was arranged to simulate the effect of warmth or coolness as required. The main lighting was from fluorescent lamps in the arch of the roof, but auxiliary pelmet wall fittings, adjustable to give either amber or blue-green light, contributed a useful psychological effect. An ingenious device was an artificial sky outside the cabin windows which was lighted up in phase with the internal lighting changes.

Electricity and Planning

One of the events of the year which still, happily, persists, even under war conditions, is the annual luncheon of the British Electrical Development Association. The number that assembled at the Connaught Rooms (London) on March 17 must have been even greater than last year, and the speeches of the principal guest, Mr. W. S. Morrison (Minister of Town and Country Planning), and of Lord Brabazon, who presided, were heard with close attention.

Mr. Morrison foresaw a great future for electricity, which added richness and variety to the countryman's life. He anticipated that the planned use of our land might involve some change in outlook and change in organisation, but he saw no reason why these changes should hamper legitimate electrical enterprise—either by delaying develpment, e.g., refusing consent to the erection of overhead cables, or by holding up necessary extensions of plant and buildings.

Lord Brabazon's speech in reply was one of the most entertaining that we can recall hearing delivered to the Association, though it also contained a note of warning. He alluded to early contacts with Mr. Morrison, and congratulated him on the pleasure of addressing such a large body of pleople, "all charged with electricity." (People outside, he remarked, were charged *for* electricity.) His remarks were, however, in the main not directed to Mr. Morrison's department, but to the Ministry of Fuel and Power. That Ministry, he said, was doing good work, and the B.E.D.A. were prepared to cooperate with them in using the fuel resources of the country in the best possible way. But there was being conceived in the bowels of the Ministry a monster (the National Fuel and Advisory Council), which was credited with the desire to regulate who should use one form of power or light and who should use another. In picturesque terms he warned the Ministry of the opposition which any attempt to "put a quick one against us in war time" would inevitably provoke.

Presidential Visits to I.E.S. Centres

Although the I.E.S. president (Dr. H. Buckley), having been absent on a special mission during the early part of the session, was unable to pay visits to the various Centres before February in the present year, he has since been active in this respect, visiting Glasgow on February 18 and Newcastle on March 1, where he was most hospitably received.

At both Centres Dr. Buckley delivered his address, reviewing some Eighteenth-Century Contributions to Photometry and Illuminating Engineering. He also took the opportunity of telling members present something of the aims which the Council had in view for the future and of the special problems—partly administrative and partly financial—which would confront them in time to come. He mentioned, for example, the proposal to establish a central committee for the supervision of reseach, such as the investigations of lighting for special industries, which some Centres were already initiating, and the ideas that were being explored in regard to post-war I.E.S. development, and the status and education of members, based on suggestions received in response to the questionnaire distributed by Mr. Ackerley in 1943.

The address, with its account of the early work of Bouguer, Lambert, Rumford, and others was heard with great interest. Glasgow felt a national pride in the early improvements in photometry initiated by Ritchie, of Tain Academy, Ross-shire, and in Newcastle Mr. Gregory, who proposed a vote of thanks to the president, made a spirited claim that Count Rumford, notwithstanding his place of birth and long sojourn in foreign lands, was a Britisher, as well as the first illuminating engineer!

At both meetings the chairman of the Centre, Mr. J. Dickson in Glasgow and Mr. J. M. A. Mitchel in Newcastle, presided.

Fluorescent Material in Advertising

We have received from Paymaster-Captain Robert R. Hoare, R.N. (retired) a copy of "Display and Signs" (March, 1944) referring to some of his devices for utilising fluorescent lighting in advertising display. Such devices should find many opportunities when the war is over, e.g., pictures and objects in cabinets, etc., which may be made to glow in a variety of colours, the range of which is continually increasing. An important element, however, is the control of the ultra-violet radiation, not only with a view to getting the most efficient production of even brightness but also to avoid possible direction of stray rays into the eyes of observers and the consequent irritating "luminous haze." This can be effected by focusing the light from surrounding surfaces and peripheral mirrors and also by reflection from the interior side of covering glasses, as the inventor has also done with visible light.

Lighting Education—and Other Problems

Notes on a meeting of the I.E.S. Newcastle Centre held on January 5, 1944.

The problem of the education of illuminating engineers, a very crucial one at the present time, was introduced at a recent meeting of the I.E.S. Newcastle Centre by Mr. H. L. James, who gave a very effective and helpful picture of the present situation. From his own experience he pointed out the difficulties of the technical college, which cannot furnish a special course in illuminating when applicants are so few. On the other hand, the student who goes through the conventional three or five-year course gets his instruction in disconnected fragments, and on many practical aspects he gets nothing. Apart from the details that should evidently be included in such a course, there are some subjects, not ordinarily touched, which may be very important—for example, training in organisation and artistic appreciation.

Mr. James emphasised the importance of co-operation from firms in the lighting industry, and the chairman (Mr. J. M. A. Mitchell) gave some particulars of what is being done in the field of gas lighting. Other speakers referred to the possibilities of apprentices having time off to receive instruction at colleges, though such attendance is occasionally interrupted owing to pressure of work.

There were two points that were specially stressed in this discussion: (1) that the responsibility for organising such instruction rests largely on firms in the lighting industry, and (2) that if students are expected to attend courses in any considerable numbers they must have *something to work for*, e.g., something in the nature of a diploma (the City and Guilds examination was considered too stiff), and, above all, the prospect of employment. Realisation of these aims depends in turn very largely on the demand by users for trained men, and this should be fostered in every possible way.

The subsequent papers were closely related. Mr. Batey dealt with lighting as an aid to industry, Mr. R. H. Paterson, jun., with the installation problems of the contractor, and Mr. Rolfe with the question of maintenance. Mr. Batey stressed the economic benefit of good lighting in relation to production. Mr. Paterson illustrated some of the difficutlies experienced by contractors in carrying out installations to plan, and both he and Mr. Rolfe dealt in some detail with the question of maintenance.

In the discussion allusion was made to the vital importance of easy access to fittings—in many buildings where there is a false ceiling raising and lowering of units can be arranged with great advantage. There was some difference of opinion in regard to pilot lighting, some stressing its importance from the standpoint of convenience and safety, whereas others stated that many night watchmen prefer not to have any lighting and to use their torches.

In connection with maintenance Mr. Underwood made a telling point by emphasising the great importance attached to regular inspection of fittings by street lighting authorities. Interiors are rarely treated in the same systematic manner—yet the lighting inside a building is just as important as the lighting outside it!

Colorimetry Applied to Dyestuffs

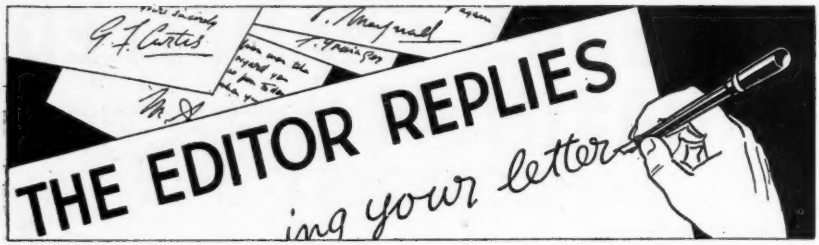
A very practical problem, in which colour measurement can be of great value to the industrialist, was described to the Colour Group on January 25 by Dr. T. Vickerstaff, of I.C.I. Dyestuffs, Ltd., who took as the title of his lecture, "Some difficulties encountered in applying the theory of McAdam's limiting brightness to real dyestuffs."

At the outset, Dr. Vickerstaff pointed out that to the dyer the term "brightness," as applied to a dye, meant its vividness or brilliance and not its brightness as understood by the illuminating engineer. The latter quality (or more correctly, the reflection factor) was termed "brightness" by the lecturer in order to avoid any confusion. He then went on to explain that, since dyestuffs produced colour by the absorption of some of the incident light, the purity of a coloured surface could not be increased indefinitely without a decrease in brightness. (As the chairman, Mr. Guild, put it later on, what was obtained in the limit was a "perfectly pure darkness.") The limits of purity which could be obtained at any brightness level were determined for all dominant wave-lengths by a diagram due to McAdam, and it was of immense practical importance to the chemist working on this subject to know how nearly any existing dyestuff approached the theoretical limit, and so what was the scope for improvement as far as that particular colour was concerned.

The problem which Dr. Vickerstaff had set out to solve was, therefore, to find a satisfactory basis upon which to express the performance of any real dye in terms of the performance of an ideally perfect dye having the same dominant wave-length. Simple colorimetry of a dyed pattern was of no use, since the efficiency measured in this way depended on the amount of dyestuff in the pattern, and so did not give the efficiency of the dye itself, apart from the pattern. However, it was thought that the maximum excitation purity obtainable with the dye might be used, this being compared with the limiting excitation purity theoretically possible at the same brightness and dominant wave-length. Unfortunately, it was found that the results obtained in this way depended on the geometry of the chromaticity diagram. Next, the use of colorimetric purity instead of excitation purity was tried, but while this got over the previous difficulty it was found that the uncoloured light scattered from the surface of the patterns caused the colorimetric purity to be dependent on brightness.

Finally, it was found that the desired information could be obtained by converting the measurements into psychological units, using the data recently published in America on the Munsell system. The scope for improvement in a particular dyestuff is expressed in terms of the number of steps of chroma between the actual dye and the ideal, the comparison being made at that value of brightness for which the ideal has maximum chroma at the dominant wave-length under consideration.

An interesting discussion followed the author's very clear presentation of a somewhat involved theme. Mr. J. G. Holmes decribed the analogous problem in the production of transparent coloured media. The limitations imposed by the available materials were very great in this case, though the results were not complicated by surface-scattered light. Dr. Wright suggested that the results might be complicated if the dye were fluorescent; Dr. Vickerstaff agreed that this was so, and cited rhodamine as a case in point.



Mr. W. G. Darley, a reader in the United States, takes up the reference in our December issue to the alleged value of **orange light** for the illumination of **charthouses at sea.** He sent me a copy of a contribution of Mr. Earl M. Lowry, of the Eastman Kodak Company, who found that the time necessary for dark adaptation depends inherently on the brightness of the visual field, irrespective of colour.

This conclusion demands respect—and yet I have also good authority for the belief that, for a given brightness, orange and red light produce less "after-dazzle" than does white or blue light. I fancy, however, that this refers to experience in almost absolute darkness and to the peripheral region of the retina, which is the part mainly used by the eye in a state of complete dark-adaptation. Very probably Mr. Lowry's dictum would apply to the *fovea*.

Mr. Darley also sends me some illustrations of **"scialitic" lamps** as used for the lighting of operating tables in hospitals. Some of these have the umbrella-like shape to which I referred —but I gather that these lamps, like others, utilise specular reflection (the contour of the surfaces being usually elliptical), and that it would be impracticable to produce "shadowless" illumination of the requisite intensity by simple diffusion.

Another reader has sent me a cutting from the lay Press referring to alleged **marvellous developments in light sources** in America, including "a brilliant fluorescent lamp not attached to any wiring which can be carried round with perfect safety."

The excitation of a luminous discharge by radiated energy is, of course, a familiar experiment. Neon tubes have long been used as detectors, and I am told that the ordinary fluorescent 5-ft. tubes give quite a substantial light in the vicinity of a radio station! Sources thus excited might therefore prove of some value, for example, if embodied in a decorative design and stimulated by radiation from a closely adjacent source. It seems evident, however, that the efficiency of such an arrangement would of necessity be extremely low and, as

sources of light for purposes of illumination, hardly seem likely to be of much service.

How far is it expedient to have definite rules covering specific lighting problems? Requirements in factories have been clearly stated and there is a pretty clear understanding in regard to school lighting. I have, however, been recently asked if there is available **a specification** for the **lighting of drawing boards**—a field where some difference of opinion still exists. It seems hardly desirable to try to frame a general specification, but it might be possible to lay down guiding principles for several alternative methods.

It is a hopeful sign that I have several times been asked lately for guidance on **post-war street lighting.** The only official publication that can be usefully quoted here is the final report of the M.O.T. Committee, issued in August, 1937. A fairly full summary appeared in "Light and Lighting" for November in the same year.

The old question—**how much light is necessary for reading?** I have come to believe that age has much to do with this, which may explain why the writer, who can read a Prayer Book passably well under a table lamp, finds the greatest difficulty in doing so in church; and why Mr. A. H. Owen requires 120 ft.c., from a fluorescent lamp before he can enter upon the task of darning socks!

Dr. J. H. Nelson has returned to the charge on the question of **light surroundings.** He does not really believe that a dark dado up to 4 ft. 6 in. is desirable—even if cleaning **is** a problem. [In most rooms containing machinery this, in any case, furnishes the equivalent of a dado.] I agree that in almost all circumstances moderately light surroundings are advantageous, but this is not always so when a specific object is to be revealed. A vase of light coloured flowers, for instance, is at its best against a relatively dark background and at its worst in its usual position, on a table near the window, with the brightly lighted outside scene as a background.

I have been asked whether there are any statistics to show that **accidents in the home** have become more frequent by reason of the blackout—which usually means diminished illumination on stairs and corridors (though it should not). I will make inquiries, though I hardly hope to get any very definite evidence.

There is, however, no question of the drawbacks of semi-darkness, which gives mankind "occasion to stumble." An excellent instance occurred at a recent I.E.S. meeting in London when the honorary secretary, anxious to remove his head out of the beam of the lantern, shifted the legs of his chair beyond the limits of the platform—with crashing results, which interrupted the lecture, but fortunately caused no physical damage.

Lighting Aircraft Assembly Shops

The aircraft industry is at present one of the most important of all British industries. It embodies an exceptionally great variety of operations—some simple engineering jobs, others extremely intricate and exacting. One, therefore, often finds different methods of lighting in use in different sections. Thus, in the works here considered, several forms of discharge lighting, as well as high and low voltage filament lamps, are all in use.

In the assembly shop here illustrated, however, tungsten lamps are exclusively used. In the extremely large bay seen in the picture complete aircraft are assembled for preliminary tests. The main lighting is effected by 320 1,000-watt tungsten lamps fitted into concentrating reflectors, mounted 35 ft. high and 25 ft. apart, which furnish a general illumination, throughout the entire area, of 20 ft.c. This unusually high mounting is necessary for this type of work and allows a clear view throughout the room.

Although the illumination provided (20 ft.c.) might be considered ample for nearly all purposes, it is nevertheless supplemented by local lighting for certain operations, for example, interior wiring, undertaken in situations where the general lighting cannot readily penetrate. This auxiliary lighting is provided by low voltage lamps fed by a suitable transformer.

In other sections devoted to wing assembly a lower mounting height, 15 ft. above floor level, is permissible, and 300 w. lamps spaced at 12 ft. centres are used, the illumination here being about 12 ft.c.

The bay in this large aircraft assembly shop covers an area of no less than 144,000 square feet. It is lighted by 320 1,000-watt Osram lamps, which provide 20 ft.c. over the entire area.

Before and After

"Before and after" photographs, showing the changed conditions secured by an improved lighting system, were at one time rather usual in electrical journals. This method of presentation admittedly needs care, but undoubtedly it still serves a useful purpose—especially when a change in the nature of the lighting, as well as increased illumination, has taken place. We have before us two such pictures relating to a recent Benjamin lighting installation in a textile factory. The advantages of the raising of the level of the lighting units, coupled with the introduction of RLM reflectors to screen the lamps, are evident, as well as the more efficient location of the units in relation to the looms.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

PHOTOMETRY AND INSTRUMENTS

1. Equipment and Procedure for Photometric Measurements of Blackout and Dimout Luminaires. Committee on Instruments and Measurements. Am. Illum. Eng. Soc. Trans., pp. 509-514, November, 1943. Circuits and response curves are given for several recently designed photo-electric photometers for low illuminations. J. S. S.

2. Description of Method for Measuring Atmospheric Transmission. Committee on Instruments and Measurements. Am. Illum. Eng. Soc. Trans., pp. 515-519, November, 1943. The method is based on the measurement of the reduction by the atmosphere of the illumination from a small projector. The illumination is measured by means of a photo-electric cell placed near the focus of a 24-in. parabolic collecting mirror. J. S. S.

SOURCES OF LIGHT AND LIGHTING EQUIPMENT

3. 3-Kw. Lighting Units. T. B. Brown. Magazine of Light, XII., No. 5, pp. 6-7, August, 1943. Details, with diagrams and photographs, are given of an industrial installation using 3 kw. discharge lamps. C. A. M.

4. Fluorescent Tube Control Unit. Anon. Electrical Times, Vol. 105, No. 2728. A brief description is given of a control unit for fluorescent tubes in which all the components are mounted in a single sheet-steel case. The unit can be mounted either on the reflector or on an adjacent wall. W. E. H.

5. Ballast Air Conditioning. A. B. Oday. Magazine of Light, XII., No. 5, pp. 14-16, August, 1943. The problem of cooling ballasts to fluorescent lamps is discussed. C. A. M.

6. How to Correct Trouble on Series-Lighting Circuits. George A. Eddy. El. World, 120, p. 1710, November 13, 1943. It is not always easy for the engineer who is used to parallel lighting circuits to diagnose the cause of trouble in a series-lighting circuit. A chart has therefore been prepared listing the types of fault that may be met and setting out probable causes and method of correction. S. S. B.

7. Visibility of Signal Lights. J. D. Lash, G. F. Prideaux. Am. Illum. Eng. Soc. Trans., pp. 481-492, November, 1943. An abstract is given from British, American, and Dutch sources of data pertinent to practical signal problems. J. S. S.

8. Lens Cement. Anon. Review of Scientific Instruments. Vol. 14, No. 11. It has been found that camera lenses using cement made from natural Canada balsam have been breaking up and discolouring due to the extremes of temperature met with in their use in combat areas. A new adhesive has been developed which is satisfactory over a temperature range from fifty to sixty degrees below zero to over one hundred degrees. W. E. H.

9. Light Sources and Utilization. W. Sturrock. Am. Illum. Eng. Soc. Trans., pp. 499-503, November, 1943. Suggestions are made for the best use of the range of lamps available for factory lighting in America. J. S. S.

APPLICATIONS OF LIGHT

10. New Standards for Coast School Lighting. Anon. El. World, 120, p. 1527, October 30, 1943. A programme has been prepared in California for the improvement of school lighting based on three lines of approach to the problem, which are briefly outlined. S. S. B.

11. The Role of Lighting in Accident Prevention. H. L. Logan. Elect. Engineering, 62, p. 143, April, 1943. The generally unsuspected high rate of industrial and civilian accidents is pointed out (with figures comparing with war casualties), and the part played by good lighting in accident prevention is outlined. The lack of completeness of data on this matter is recognised, but a review of what evidence is available is presented, and an attempt is made to derive a quantitative relation between field brightness (or illumination in typical situations) and relative accident rate. This is applied, as an example, to the steel industry, and the serious proportions of the percentage of accidents due to inadequate lighting clearly brought out. S. S. B.

12. The Effectiveness of Lighting—Its Numerical Assessment by Methods Based on Blinking Rates. Sheila J. MacPherson. Am. Illum. Eng. Soc. Trans,. pp. 520-522, November, 1943. The conclusion of this paper, originally published in the Trans. of the I.E.S. of Great Britain, is that the rate of blinking cannot be satisfactorily used as a measure of good or bad lighting. J. S. S.

13. Colour in Factories. Anon. Magazine of Light, XII., No. 5, pp. 8-10, August, 1943. The effect of coloured objects and equipment generally on the ease of seeing in a factory is discussed. Diagrams indicate colour schemes for plant in a textile mill. C. A. M.

14. Light Sources and Utilisation. Walter Sturrock. Magazine of Light XII., No. 5, pp. 11-13, August, 1943. A general discussion is given of the use of various light sources for industrial lighting. For high mounting 400 w. and 3 kw. lamps are recommended and for low mounting fluorescent tubes are in the main more satisfactory. The commercial merits of the various circuit arrangement of fluorescent lamps are also dealt with. C. A. M.

15. Fluorescent Lighting in Wartime Britain. R. O. Ackerley. Elect. Engineering, 62, p. 203, May, 1943. The author described the development of mains voltage fluorescent tubes, following the high voltage type, and the effect of the war on the choice of lamp wattage and characteristics, and on the design of fittings. The most beneficial qualities of fluorescent lighting are listed. S. S. B.

16. Making Use of What You Have in Wiring and Equipment to Get What You Want in Lighting. H. L. Miller. Am. Illum. Eng. Soc. Trans., pp. 504-508, November, 1943. Methods are suggested for increasing the light output available with existing wiring installations. J. S. S.

17. Post-War Plan for Lighting Promotion. O. R. Doerr. El. World, 120, p. 1557, October 30, 1943. A list of eight points has been drawn up showing how good lighting can be promoted after the war by the American electric utility companies, contractors, and lighting sales organisations. A survey of probable requirements is advocated, and co-operation between different branches of the industry strongly recommended. The importance of advertising and the planning of adequate stocks is stressed. S. S. B.

Reviews of Books

The "Gas Journal" Calendar and Directory. (*Walter King, Ltd., London,* 1944; *pp.* 244 + xxxxii.)

Once again this familiar directory has made its appearance. As is inevitable in present circumstances the contents show little change, but the useful items remain. It will be recalled that the publication consists of three sections: the directory, the handbook, and the trade sections. To most of our readers the directory, which contains the usual comprehensive list of gas undertakings and also a list of public lighting engineers, will prove the most useful portion. In the handbook the headings appear to be substantially the same as for 1943, though we notice a new entry ("ammonia recovery"). Tabular data portraying the growth of the gas industry necessarily will stop short at 1938—let us hope that by the time the next issue appears circumstances will have made it possible to bring this record up to date!

The Practical Electrician's Pocket Book. (*Electrical Trading and Radio Marketing, London,* 1944; *pp.* 424+xxx; 3*s.* 6*d. net.*)

This useful little pocket-book contains material substantially similar to that offered in previous years. It appeals mainly to the working electrician and the student, and contains a remarkable amount of condensed information. There is a section on Illumination and Photometry and some further data on photometers are included under the heading of Measuring Instruments. Other subjects cover a wide range—from "Agriculture, Electricity In" to "Wiring Regulations." New chapters on "Electronics in Industry," "Wiring for Sound Distribution," and "Bell and Alarm Circuits" have been added and the whole of the book has been fully revised.

The following has also been received and will be reviewed in due course:—

Fluorescent Lighting, by A. D. S. Atkinson. (*Geo. Newnes, Ltd., London,* 1944; *pp.* 144, *figs.* 67. *Price,* 12*s.* 6*d.*)